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PRODUCT EVALUATION Effective November 1, 2012
CWSF-24

*The following product has been evaluated for compliance with the wind loads specified in the **International Residential Code (IRC)** and the **International Building Code (IBC)**. This product shall be subject to reevaluation **April 2013**.*

This product evaluation is not an endorsement of this product or a recommendation that this product be used. The Texas Department of Insurance has not authorized the use of any information contained in the product evaluation for advertising, or other commercial or promotional purpose.

This product evaluation is intended for use by those individuals who are following the design wind load criteria in Chapter 3 of the IRC and Section 1609 of the IBC. The design loads determined for the building or structure shall not exceed the design load rating specified for the products shown in the limitations section of this product evaluation. This product evaluation does not relieve a Texas licensed engineer of his responsibilities as outlined in the Texas Insurance Code, the Texas Administrative Code, and the Texas Engineering Practice Act.

Series HR-251 StormMax Curtain Wall System, Impact Resistant, manufactured by

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will be acceptable in designated catastrophe areas along the Texas Gulf Coast when installed in accordance with the manufacturer's installation instructions and this product evaluation.

PRODUCT DESCRIPTION

The HR-251 StormMax Curtain Wall System is an aluminum frame curtain wall system used for commercial installations. The aluminum frame curtain wall system is fixed windows. The perimeter frame members are 2 ½ " x 7 ½ " and the mullions are 2 ½ " x 7 ½ ". The aluminum curtain wall system evaluated in this report is an impact resistant system. This product evaluation report is for an aluminum frame curtain wall system based on the following tested constructions:

System 1: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each 60" x 150") mulled together along their side jambs (vertical mull). The assembly has daylight opening sizes of 57 ½ " x 96" and 57 ½ " X 46 ½ " above. The overall dimension is 182 ½ " x 150 ½ ".

System 2: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each: 48" x 120") mulled together along their side jambs (vertical mull). The assembly has (2) units with daylight opening sizes of 45 ½ " x 84" and 45 ½ " x 28 ½ " and (1) unit 45 ½ " x 96" and 45 ½ " x 16 ½ ". The overall dimension is 146 ½ " x 120".

System 3: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each: 60" x 120") mulled together along their side jambs (vertical mull). The assembly has (2) units with daylight opening sizes of 57 ½ " x 84" and 57 ½ " x 28 ½ " and (1) unit 57 ½ " x 96" and 45 ½ " x 16 ½ ". The overall dimension is 182 ½ " x 120".

System 4: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of a twin span fixed window assembly (Each: 60" x 300") mulled together along their side jambs: (vertical mull) and includes a

corner assembly with a 64 1/16" return section. The assembly has daylight opening sizes of 57 1/2" x 84" and 57 1/2" X 34 1/2". The overall dimension is 184 1/16" x 300".

System 5: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of two fixed window assemblies (Each: 60" x 101") mulled together along their side jambs (vertical mull). The assembly has daylight opening sizes of 57 1/2" x 96". The overall dimension is 122 1/2" x 101".

System 6: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of two fixed window assemblies (Each: 60" x 150") mulled together along their side jambs (vertical mull). The assembly has daylight opening sizes of 57 1/2" x 96". The overall dimension is 122 1/2" x 150".

System 7: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each 60" X 150") mulled together along their side jambs (vertical mull). The assembly has daylight opening sizes of 57 1/2" x 96" and 57 1/2" x 46 1/2" above. The overall dimension is 182 1/2" x 150 1/2".

System 8: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each: 48" x 144") mulled together along their side jambs (vertical mull). The assembly has units with daylight opening sizes of 45 1/2" x 96" and 45 1/2" x 40 1/2". The overall dimension is 146 1/2" x 144".

System 9: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each: 48" x 101") mulled together along their side jambs (vertical mull). The assembly has units with daylight opening sizes of 45 1/2" x 96". The overall dimension is 146 1/2" x 101".

System 10: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of a twin span fixed window assembly (Each: 48" x 300") mulled together along their side jambs (vertical mull) and includes a corner assembly with a 52 3/32" return section. The assembly has daylight opening sizes of 45 1/2" x 84" and 45 1/2" X 35 1/2". The overall dimension is 148 3/32" x 300".

System 11: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each: 60" x 89") mulled together along their side jambs (vertical mull). The assembly has units with daylight opening sizes of 57 1/2" x 84". The overall dimension is 182 1/2" x 89".

System 12: StormMax HR-251 Aluminum Frame Curtain Wall System is comprised of three fixed window assemblies (Each: 60" x 89") mulled together along their side jambs (vertical mull). The assembly has units with daylight opening sizes of 57 1/2" x 84". The overall dimension is 182 1/2" x 89".

Glazing Description:

System	Glass Construction [1]	Glazing Method [2]
1	IG-1 & IG-4	GM-1
2	IG-1 & IG-4	GM-1
3	IG-3 & IG-4	GM-1
4	IG-1, IG-2 & IG-5	GM-1
5	IG-1	GM-1
6	IG-3 & IG-4	GM-1
7	IG-1	GM-2
8	IG-3 & IG-4	GM-1
9	IG-4	GM-1
10	IG-4 & IG-5	GM-1
11	IG-6	GM-1
12	IG-7	GM-1

Note: [1] See the "Glass Construction Key" for the glazing construction.
[2] See the "Glazing Method Key" for the glazing method description.

Glass Construction Key:

IG-1: Insulated laminated glass unit. The unit is made up of: ¼" tempered outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.090" Sentryglass interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

IG-2: Insulated laminated glass unit. The unit is made up of: ¼" heat strengthened outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.060 Butacite PVB interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

IG-3: Insulated laminated glass unit. The unit is made up of: ¼" heat strengthened outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.090" Saflex PVB interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

IG-4: Insulated laminated glass unit. The unit is made up of: ¼" heat strengthened outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.075" Vanceva/Stormglass interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

IG-5: Insulated laminated glass unit. The unit is made up of: ¼" heat strengthened outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.060 Saflex PVB interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

IG-6: Insulated laminated glass unit. The unit is made up of: ¼" tempered outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.060 Butacite PVB interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

IG-7: Insulated laminated glass unit. The unit is made up of: ¼" tempered outboard lite ½: air space: (2) ¼" heat strengthened lites; over a 0.060 Saflex PVB interlayer. The glass thickness and type used in the laminated glass unit shall comply with ASTM E 1300-04.

Glazing Method Key:

GM-1: The laminated glass unit is exterior glazed with ¾" glazing penetration using structural silicone and a FG-5185 vinyl gasket between the aluminum on the interior side of the glass and a GP-118 vinyl gasket on the exterior side of the glass. There are two (2) neoprene setting blocks between the glass on the bottom and the aluminum at each section of the glass unit.

GM-2: The laminated glass unit is exterior glazed with ¾" glazing penetration using GP-1015 vinyl gasket between the aluminum on the interior side of the glass and a GP-118 vinyl gasket on the exterior side of the glass. There are two (2) neoprene setting blocks between the glass on the bottom and the aluminum at each section of the glass unit.

Frame Construction: The frame was constructed of extruded aluminum members.

Vertical Mullions: The vertical members consist of hollow extruded aluminum with various wall thickness' are continuous from head to sill. The corners were straight cut, butted sealed using strips of Schnee-Morehead SM5601 Tacky Tape.

Horizontal Mullions: The horizontal members consist of hollow extruded aluminum with various wall thicknesses. The corners were straight cut, butted sealed and secured with (4) #14 X 1" hex head fasteners through the vertical members and threaded into the horizontal member's screw spline.

Reinforcement:

Systems 1, 6, 7, 8 and 10: Intermediate vertical mullions utilized a 4 ¾" X 1 ⅞" X ¼" thick steel secured with (2) ¼-20 x 2" bolt with nut. Fastening bolt is located at horizontal mullion and at head and sill.

Systems 4 and 5: Intermediate vertical mullions utilized a 4 ¾" X 1 ⅞" X ¼" thick steel channel ⅜" X 4" steel bar both secured with (2) ¼-20 x 2" bolt with nut. Fastening bolt is located at horizontal mullion and at head and sill

Systems 2, 3, 9, 11 and 12: None.

Product Identification: A label will be affixed to the window wall system. The label includes the manufacturer's name, the product name, and the design pressure rating.

LIMITATIONS

Allowable Dimensions:

System 1:

Maximum Individual Window Dimensions: 62 ½" x 150".
Infinite Overall Frame Width
Maximum Vertical Mullion Length: 150"
Maximum Day Light Opening: 57 ½" X 96"

System 2:

Maximum Individual Window Dimensions: 48" x 120"
Infinite Overall Frame Width
Maximum Vertical Length: 120"
Maximum Day Light Opening: 45 ½" X 96"

System 3:

Maximum Individual Window Dimensions: 62 ½" x 160"
Infinite Overall Frame Width
Maximum Vertical Length: 120"
Maximum Day Light Opening: 57 ½" X 96"

System 4:

Maximum Individual Window Dimensions: 62 ½" x 300"
Infinite Overall Frame Width
Maximum Vertical Length: 300"
Maximum Day Light Opening: 57 ½" X 84"

System 5:

Maximum Individual Window Dimensions: 62 ½" x 101"
Infinite Overall Frame Width
Maximum Vertical Length: 101"
Maximum Day Light Opening: 57 ½" X 96"

System 6:

Maximum Individual Window Dimensions: 62 ½" x 150"
Infinite Overall Frame Width
Maximum Vertical Length: 150"

Maximum Day Light Opening: 57 ½ " X 96"

System 7:
Maximum Individual Window Dimensions: 62 ½ " x 150"
Infinite Overall Frame Width
Maximum Vertical Length: 150"
Maximum Day Light Opening: 57 ½ " X 96"

System 8:
Maximum Individual Window Dimensions: 50 ½ " x 144"
Infinite Overall Frame Width
Maximum Vertical Length: 144" to each anchor point
Maximum Day Light Opening: 57 ½ " X 96"

System 9:
Maximum Individual Window Dimensions: 50 ½ " x 101"
Infinite Overall Frame Width
Maximum Vertical Length: 101" to each anchor point
Maximum Day Light Opening: 45 ½ " X 96"

System 10:
Maximum Individual Window Dimensions: 50 ½ " x 300"
Infinite Overall Frame Width
Maximum Vertical Mullion Length: 300"
Maximum Day Light Opening: 45 ½ " X 84"

System 11:
Maximum Individual Window Dimensions: 60" x 96"
Infinite Overall Frame Width
Maximum Vertical Mullion Length: 96"
Maximum Day Light Opening: 57 ½ " X 84"

System 12:
Maximum Individual Window Dimensions: 60" x 96"
Infinite Overall Frame Width
Maximum Vertical Mullion Length: 96"
Maximum Day Light Opening: 57 ½ " X 84"

Design Pressures (DP):

System 1: ±100 psf (with Glass Construction IG-1 and IG-4)

System 2: ±65 psf (with Glass Construction IG-1 and IG-4)

System 3: +70, -76 psf (with Glass Construction IG-3 and IG-4)

System 4: ±90 psf (with Glass Construction IG-1, IG-2 and IG-5)

System 5: ±90 psf (with Glass Construction IG-1)

System 6: ±100 psf (with Glass Construction IG-3 and IG-4)

System 7: ±70 psf (with Glass Construction IG-1)

System 8: +85, -90 psf (with Glass Construction IG-3 and IG-4)

System 9: ±67 psf (with Glass Construction IG-4)

System 10: ±90 psf (with Glass Construction IG-4 and IG-5)

System 11: ±90 psf (with Glass Construction IG-6)

System 12: ±90 psf (with Glass Construction IG-7)

Impact Resistance: Curtain wall assemblies constructed with glass construction (IG-1, IG-3 and IG-4) satisfy the Texas Department of Insurance's criteria for protection from windborne debris in both the **Inland I** and **Seaward** zones. These curtain wall assemblies have passed an impact criteria equivalent to Missile Level D specified in ASTM E 1996-05. These curtain wall assemblies may be installed at any height on the structure as long as the design pressure rating for the assembly is not exceeded. These curtain wall assemblies will not need to be protected with an impact protective system when installed in areas where windborne debris protection is required.

Exception: Curtain wall assemblies constructed with glass construction (IG-2, IG-5, IG-6 and IG-7) have passed an impact criteria equivalent to Missile Level A (Small Missile) specified in ASTM E 1996-05. These curtain wall assemblies may be installed on a structure as long as the design pressure rating for the assembly is not exceeded. These curtain wall assemblies will not need to be protected with an impact protective system when installed in areas where windborne debris protection is required if installed on a structure more than 30 feet above grade.

Acceptance of Smaller Assemblies: Windows assemblies with dimensions equal to or smaller than those specified above are acceptable within the limitations specified in this report.

INSTALLATION INSTRUCTIONS

General: The curtain wall assembly shall be prepared and installed in accordance with "StormMax HR-251 Curtain Wall Installation and Glazing Manual," sheets 1 thru 91, dated May 2012, Oldcastle BuildingEnvelope and this product evaluation report. Detailed installation instructions and drawings are available from the manufacturer.

Installation:

Systems 1, 2, 3, 8 and 9: The wall framing shall be minimum 0.634" thick A36 steel. The head and sill are secured with ½-13 x 2" HH steel bolt with matching washer and nut. The fasteners shall be located 4" on each side of each vertical member. At each jamb, the midpoint of the intermediate horizontal members is secured with one (1) ⅜-13 x 4½" HH steel bolt with matching washer and nut.

Systems 4 and 10: The wall framing shall be minimum 0.634" thick A36 steel. At each jamb, the midpoint of the intermediate horizontal members is secured with one (1) ⅜-13 x 4½" HH steel bolt with matching washer and nut. The sill is anchored with ½ x 4½" Hilti Kwik Bolt 3 or with ½ x 4" Tapcons located 4" on each side of each vertical.

For the jambs and intermediate mullions (head), a head anchor (HR-FP-24) is anchored to the steel framing with two (2) ½-13 x 2" HH steel bolt with matching washer and nuts, and the head anchor slides into the mullion curtain wall frame member. The intermediate mullions are anchored with two dead load anchors (4" x 6" x 5/16" x 5" long) located at a height of 153" from the sill. The anchors are welded to the framing with 3/16" long fillet welds along the top, bottom and heal edges. The dead load anchors are connected to the curtain wall frame with two (2) ⅝-11 x 4½" grade 5 bolts with matching

nuts and washers. The heads of the corner mullions are secured with corner head anchors (HR-FP-22 left) and (HR-FP-23 right). The corner head anchors are fastened to the framing with wo (2) ½ -13 x 2" HH steel bolt with matching washer and nuts and the head anchor slides into the mullion frame member. The corner mullions are also anchored with with two dead load anchors (4" x 8" x 1/4" x 5" long) located at a height of 153" from the sill. The dead load anchors are connected to the curtain wall frame with two (2) ⅝ -11 x 4 ½ " grade 5 bolts with matching nuts and washers.

Systems 5 and 7: The wall framing shall be minimum 0.634" thick A36 steel. The head and sill are secured with ½ -13 x 2" HH steel bolt with matching washer and nut. The fasteners shall be located 4" on each side of each vertical member.

System 6: The wall framing shall be minimum 0.634" thick A36 steel. The head and sill are secured with ½ -13 x 2" HH steel bolt with matching washer and nut. The fasteners shall be located 4" on each side of each vertical member. At each jamb, the midpoint of the intermediate horizontal members is secured with one (1) ⅜ -13 x 6" HH steel bolt with matching washer and nut.

Systems 11 and 12: The wall framing shall be minimum Southern Yellow Pine dimension lumber. The head and sill shall be secured to the wall framing with minimum ⅜ " x 2 ½ " lag screws. The fasteners are located 4" from each mullion and spaced 2" o.c. in a group of seven (7) fasteners located from each mullion at the head and sill. The fasteners shall be long enough to penetrate a minimum of 1 ½ inches into the wall framing.

Note: The manufacturer's installation instructions shall be available on the job site during installation. All fasteners shall be corrosion resistant as specified in the International Residential Code (IRC), the International Building Code (IBC), and the Texas Revisions.